CORPS OF ENGINEERS
Laying the Groundwork for Theater Operations

Lieutenant General Henry J. Hatch, US Army,
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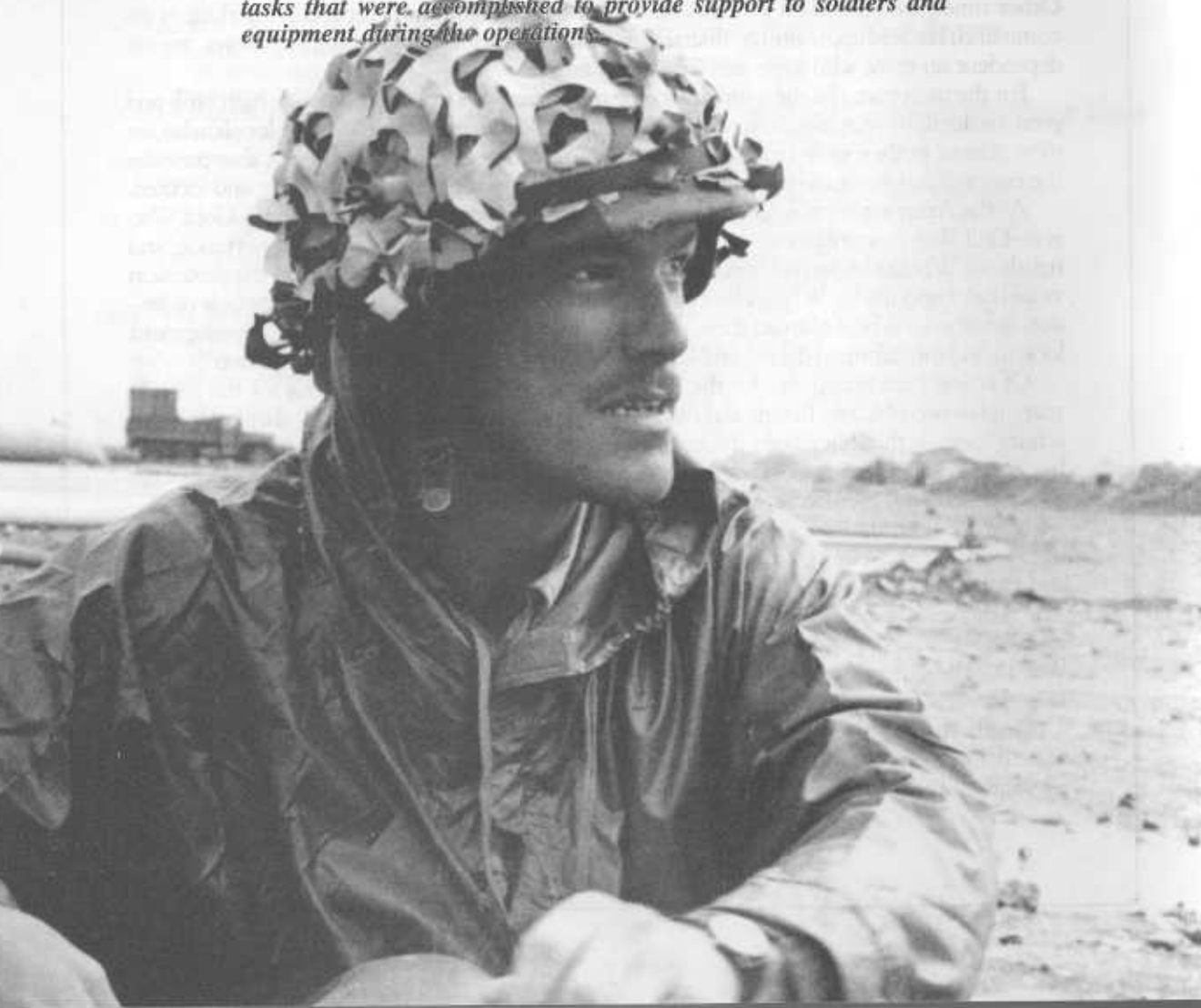
Operations Desert Shield *and* Desert Storm *placed the US military in a theater of operations where the US Corps of Engineers had years of experience. The authors review the history of the corps in Saudi Arabia prior to the 2 August invasion of Kuwait. They describe the steps taken to provide engineer support before engineer units arrived in Saudi Arabia. Finally, the authors discuss a few of the numerous tasks that were accomplished to provide support to soldiers and equipment during the operations.*



THE US Army Corps of Engineers (USACE) has maintained a presence in the Kingdom of Saudi Arabia for nearly 40 years and was responsible for constructing certain facilities and infrastructure that were vital in the successful deployment and support of US forces during operations *Desert Shield* and *Desert Storm*. The longstanding relationship between the corps and the Saudis allowed the corps to contract quickly for services and construction and lease facilities to accommodate US forces.

USACE involvement in Saudi Arabia began in 1951 with the rebuilding of the airfield at Dhahran, using US Air Force funds. The Dhahran Air Base, initially completed in 1956, became an important stopover point for US Air Force and Navy aircraft. The corps completed the construction of the Dhahran Civil Air Terminal at Dhahran Airfield in 1961.

In May 1965, the US ambassador to Saudi Arabia and the Saudi minister of Foreign Affairs signed the Engineer Assistance Agreement in which the United States agreed to provide advice and assistance for construction of certain military facilities for the Saudi Ministry of Defense and Aviation (MODA). Under this agreement, the corps constructed three military cantonments:

- King Faisal Military Cantonment near the Yemen border.
- King Abdul Aziz Military Cantonment south of the Jordan border.
- King Khalid Military City (KKMC).

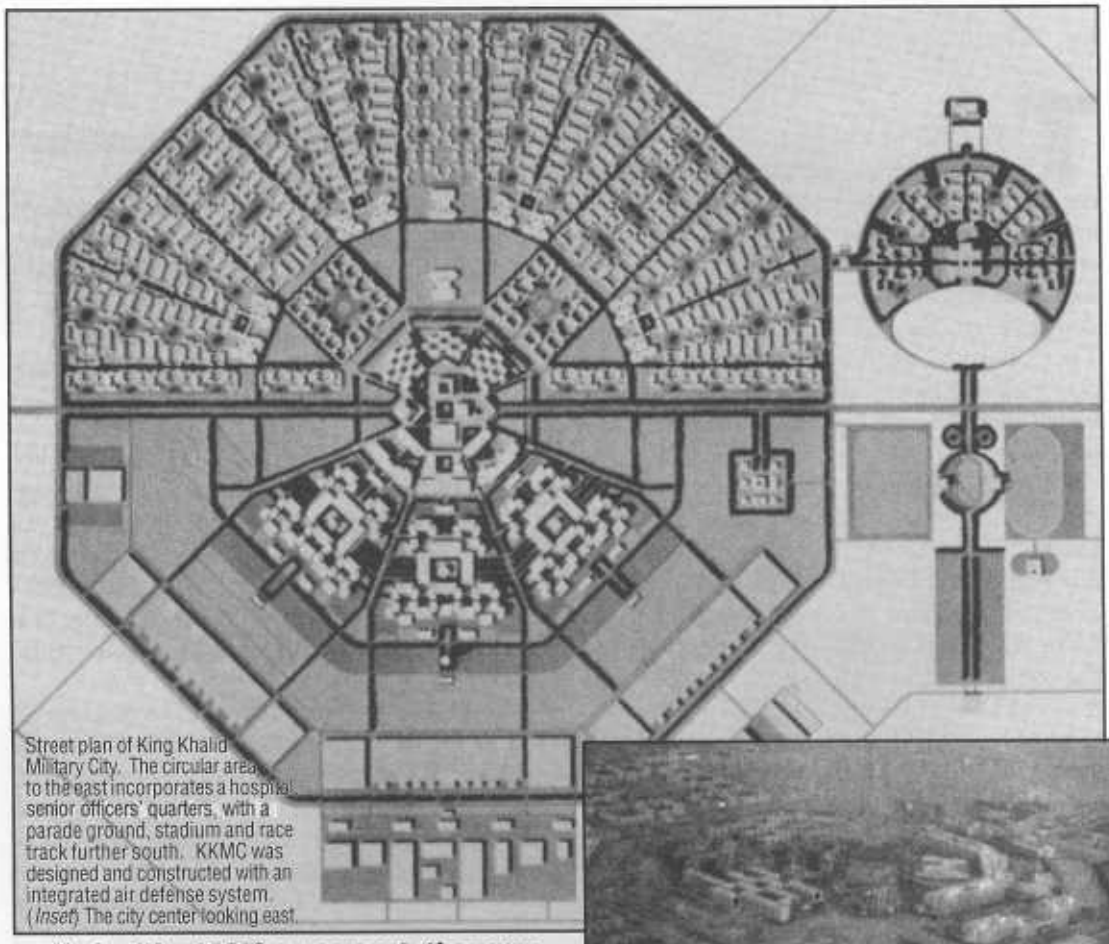
The KKMC project, finished in 1988, was a complete city and base with facilities to support a projected population of over 50,000, an airfield, hospital and engineer center and school. Other work under the agreement included a headquarters complex for the Royal Saudi Air Force, an airborne and physical training school, King Abdul Aziz Military Academy, the port at Ras al Mishab and a headquarters complex and officers club for MODA.

Under the Saudi naval expansion program, beginning in the early 1970s, the corps managed design and construction for an expansion of the naval facilities, with the US Navy as overall program manager. In the Royal Saudi Air Force program, the corps provided contracting and construction management support to the US Air Force Logistics Command for two major efforts to upgrade aircraft support facilities. Since 1966, the corps has worked with the Saudi army ordnance corps in operating and maintaining its logistics system.[1]

When the Iraqi invasion occurred, the Saudis' experience with the Corps of Engineers helped convince government officials that they could ask the United States to come into their country and that the United States would respect their customs, do professional work and leave when the work was completed.

The decades–long reimbursable program in Saudi Arabia was designed not only to provide the host nation with military cantonments and naval facilities but also to prepare the Saudis to maintain and execute future programs themselves. During the program, a bond of mutual trust and confidence developed between the Saudi Arabian government and the United States that became as important as the military infrastructure and port facilities.. When the Iraqi invasion occurred, the Saudis' experience with the Corps of Engineers helped convince government officials that they could ask the United States to come into their country and that the United States would respect their customs, do professional work and leave when the work was completed. The "nation assistance" benefits from the program were critical to the successful execution of *Desert Shield* and *Desert Storm*.

Through its Middle East Division (MED), headquartered in Riyadh, Saudi Arabia, the corps managed a design and construction program in Saudi Arabia that, by the late 1980s, totaled an estimated $14 billion. From the early 1960s, the work was done on a fully reimbursable basis with the Saudi Arabian government paying for all design and construction. As the program neared completion in the late 1980s, the MED was redesignated as the Middle East/Africa



Street plan of King Khalid Military City. The circular area to the east incorporates a hospital, senior officers' quarters, with a parade ground, stadium and race track further south. KKMC was designed and constructed with an integrated air defense system. (*Inset*) The city center looking east.

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Projects Office (MEAPO), now Transatlantic Division, and its headquarters moved to Winchester, Virginia. At the time of the Iraqi invasion, MEAPO served as the corps' design and construction agent for the Middle East and Africa. It provided engineering, design, procurement and construction services for foreign defense forces and for other US government agencies operating in the region. In August 1990, MEAPO had field offices in Egypt, Oman, Bahrain, Kuwait, Morocco and Saudi Arabia.

The Department of Defense had designated USACE as its construction agent throughout the Middle East and Africa, except for Somalia, Kenya, Ethiopia and Djibouti. USACE, in turn, designated MEAPO as its executive agent for this mission in Saudi Arabia. In addition, USACE had signed a memorandum of agreement with Third US Army in 1986, which established USACE's role in providing engineer assistance. Third Army, a major subordinate

An 82d Airborne Division trooper quenches his thirst in the shadow of a C–141, August 1990.

command of US Forces Command during peacetime, is also the US Army component (ARCENT) of US Central Command (CENTCOM). Third Army and USACE had developed a concept of operations for providing engineer support.[2]

Soon after the invasion, USACE commander, Lieutenant General Henry J. Hatch, and MEAPO commander, Colonel William A. Miller, recognized that CENTCOM would need corps assistance in providing facilities for troops. Concerned with the shortage of engineers in theater, a decision was made to use corps operations and maintenance (OMA) funds to deploy personnel, using Dulles International Airport as its aerial port of embarkation. The first corps engineer to deploy, Ben Wood, a civilian from MEAPO, left for Saudi Arabia on 13 August 1990. Two days later, Lieutenant Colonel Charles "Stoney" Cox, deputy commander of MEAPO, flew to Riyadh with two contracting officers, a construction engineer and a real estate specialist. Cox's team drove to Dhahran on 17 August and reported to the commander of the ARCENT Support Command (Provisional), Lieutenant General (then Major General) William G. Pagonis. Pagonis immediately tasked them to lease facilities for troops coming off the planes and continued to take advantage of corps expertise. With his small civilian cell, Cox established what later became known as the Dhahran Area Office (DAO), an organization that would grow as requirements mounted.[3]

There were few engineers in theater when the first corps representatives arrived, in part because CENTCOM had reduced the number of engineer units in the initial deployment to allow for the transport of maneuver units. No engineer command had yet arrived to manage construction requirements. Yet, the requirements for contract construction and real estate support were, as CENTCOM engineer Colonel Jay W. Braden described, "immediate and massive." The first elements of the 82d Airborne Division were arriving in Dhahran with no logistic structure to support them, no shelter in 120 degree heat and no sanitation facilities.[4]

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Miller arrived in Riyadh in early September and established a headquarters element, MEAPO–SWA (Southwest Asia). As the defense contract construction agent, MEAPO–SWA was a theater asset under the operational control of CENTCOM, and Miller determined that it could best support all service components by collocating with the CENTCOM engineer

In Saudi Arabia . . . time became the primary concern, then quality and cost. On occasion, the DAO staff completed projects in 30 days that ordinarily would have taken six to nine months to complete. To expedite construction, the DAO staff drew on its knowledge of the types of materials available in the region and grappled with shortages of some critical materials and equipment, particularly heavy haul equipment.

and the Regional Contingency Construction Management (RCCM) cell in Riyadh. Meanwhile, MEAPO's DAO continued to provide direct support to the ARCENT Support Command (Provisional), which later became the 22d Support Command (SUPCOM) and other services in the Eastern Province of Saudi Arabia.[5]

One of the corps' major missions in support of *Desert Shield* and *Desert Storm* was to contract for construction. Its first major construction contract was for six 5,000–man base camps, later called life support areas. The urgency for the contract was great not only because troops in the desert needed the facilities as quickly as possible but also because the emergency military construction money that would be used to fund these base camps had to be obligated by 30 September 1990, the end of the fiscal year. DAO went from developing the criteria for the life support areas to the award of the contract in four weeks. The corps issued the request for proposals for the life support areas on 19 September 1990 and awarded the contract to Mechanical and Civil Engineering Saudi Arabia, Ltd. on 28 September 1990. The $26 million contract called for the construction of six initial standard base camps for units deployed to Saudi Arabia, to include dining facilities, showers, latrines, areas for tents and compacted roadways.[6]

The corps also awarded construction contracts for the application of dust palliative. Blowing dust chewed up expensive equipment and threatened the safety of helicopter pilots trying to take off or land in the thick clouds. Dust palliative works well on compacted material, but when used on a loose surface such as sand, it quickly breaks up under foot traffic. Contractors tried various means of dust palliative, including emulsified asphalt CSS–1, diesel fuel or crude oil, with varying degrees of success.

Other construction contracts provided for water wells, road repair and construction and heliports. The benefits from these contracts far outweighed the costs. As the 22d SUPCOM engineer, Lieutenant Colonel Kenneth W. Cargill observed, $6 million did not seem like an unreasonable cost for a heliport that would hold 100 Apache helicopters, each worth $6 million. The 101st Aviation Brigade spent $84 million between August and November on rotor blades and engines for their helicopters, while paving a heliport at King Fahd International Airport cost only $4 million.[7]

Funding the costly construction projects, however, was a major problem. US law limited the funding of construction with OMA funds to projects under $200,000. Given the size and expense of the projects required, this limit was woefully inadequate. Use of military construction funds was a time–consuming process that required congressional approval. In October, Saudi officials indicated a willingness to pay US costs incurred in *Desert Shield*. The Saudi Arabian ambassador to the United States, HRH Prince Bandar bin Sultan, accepted a proposal to send a US team to work out procedures for host nation support. The director of the Joint Staff, Lieutenant General Michael P. C. Carns, directed Major General James W. Ray, director of Military Programs, Headquarters, USACE, to travel to Saudi Arabia to put in place an operating process that used Saudi money to pay for fuel, water, transportation and facilities. Ray, who had spent five years in Saudi Arabia and three in Europe working on projects that involved host nation support agreements, was well qualified for the mission.

Ray and a team of specialists drawn from the Joint Staff and the Office of the Secretary of Defense arrived in Saudi Arabia on 17 October. They developed and negotiated an agreement

Soldiers taking refuge from the 125-degree heat in an aircraft hangar, August 1990

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for host nation support, which Major General Dane Starling, CENTCOM J4 (logistics director), and Saudi deputy commander for Saudi Joint Forces, Major General Abdul Aziz Al Sheik, signed. Under the agreement, which became effective 1 November 1990, the Saudi Arabian government would provide, at no cost to the United States, fuel, transportation, water, food and facilities to support US forces from the time of initial deployment.[8] Before Ray left, the Saudis presented him with a check to the US Treasury for $760 million to cover in–country expenses from 7 August to 1 November.

Ray's team recommended to the CENTCOM commander that he establish a 16– to 17–person cell, headed by a general officer, to monitor and implement host nation support, and CENTCOM approved the recommendation. Brigadier General Patrick M. Stevens IV, division engineer from the corps' North Pacific Division, arrived in late November to head this cell and serve as Starling's deputy.

Formal procedures for contract construction evolved over time. Service components developed their requirements and submitted them through channels to the CENTCOM RCCM cell. The RCCM, which consisted of the CENTCOM engineer, representatives from the joint component services and the designated defense construction agent (MEAPO–SWA), consolidated, validated and prioritized the requirements. CENTCOM, then, compiled the priority list for the theater, integrating Army priorities with those of the other services. After execution of the host nation support agreement, construction requirements could be executed by one of three means:

- Saudi construction (host nation support).
- US construction contract.
- US troop construction.

A combined civil–military engineer board made up of Saudi, CENTCOM and MEAPO representatives met on a regular basis to determine which of these methods should be used.

One DAO real estate specialist maintained that the corps got the best price it could in that market and summed up the real estate effort by saying, "I think we got what we were trying to accomplish. We were trying to get our troops out of the sun, out of the sand, and into some air conditioning. . . . I think we've done something that we can be proud of."

MEAPO provided technical oversight of contracts to be executed by the Saudis to ensure that US requirements were met and provided the Saudis with design and specification packages ready for contract advertisement.[9]

The DAO received the CENTCOM priority list twice a week. When a project showed up on the list, DAO began the design work. DAO often used the Army's standardized designs (the Army Facilities Component System) but modified them to shorten construction time and cut costs. Normally, USACE stresses the following priorities in construction: quality, cost and time. In Saudi Arabia, however, time became the primary concern, then quality and cost. On occasion, the DAO staff completed projects in 30 days that ordinarily would have taken six to nine months to complete. To expedite construction, the DAO staff drew on its knowledge of the types of materials available in the region and grappled with shortages of some critical materials and equipment, particularly heavy haul equipment. As part of their construction mission, corps personnel leased construction equipment for engineer units, but they found that the contractor equipment available in Saudi Arabia was often in poor condition.[10]

Finding contractors in the region capable of completing the work in a specified time was difficult. Although there were many capable and expert construction firms in Saudi Arabia, corps representatives occasionally found themselves in the position of pulling contractors along, showing them how to save time, operate equipment, make changes in scheduling and perform certain types of work faster and more effectively. Saudi contractors occasionally worked alongside engineer units. For example, at KKMC, in the tense days leading up to the air war, engineer troops provided the contractor with dump trucks, a bulldozer and scrapers, and some night lights so he could work far into the night.[11]

In addition to construction contracts, MEAPO–SWA awarded various types of service contracts. By mid–September, it had awarded 12 service contracts in theater for field showers, burnout latrines, washstands and temporary buildings to meet storage, sleeping or maintenance needs. Latrines, showers and washstands were among the largest, most immediate requirements. When standard designs for latrines, showers and washstands, which dated from the Vietnam era, proved to be inadequate, the DAO staff modified the old designs and experimented with new ones. It awarded contracts for 5,000 latrine, shower and washstand units at a time. With each award, the staff continued to modify the design to make the units safer and more durable.[12]

More than construction and service contracts, however, real estate activities dominated the corps' effort in Saudi Arabia. US forces had no authority to seize the property they required, so they had to negotiate leases with the property owners. DAO provided real estate support for the Army, Navy and Marines—leasing billets, office space, storage facilities, mess halls, hardstands, warehouses and cold storage.

On 12 September 1990, the SUPCOM reported that real estate leasing was the predominant engineer activity. Officials were finalizing an average of four leases a week with private landowners and businesses, and the average lease provided housing for 500 people. With 7,000 to 14,000 soldiers arriving each week, however, a backlog quickly developed. By early November, there were 97 leases totaling about $94 million. During the peak period just before 1 November, the corps' 17 real estate specialists in Saudi Arabia leased 40 facilities in 17 days.[13]

The real estate program presented unique and significant challenges. Real estate specialists had difficulty arranging for facilities because they did

Arab workers erecting tents for US personnel at a Saudi air base, mid–August 1990.

[General] Ray and a team of specialists . . . arrived in Saudi Arabia on 17 October. They developed and negotiated an agreement for host nation support, which . . . became effective 1 November 1990, the Saudi Arabian government would provide, at no cost to the United States, fuel, transportation, water, food and facilities to support US forces from the time of initial deployment.

not know how long the facilities would be needed. The Saudis, who have a long tradition of bartering, were very astute negotiators, often requiring lease payment for one year in advance, which became very costly. Eventually, real estate specialists were able to modify this requirement so that the payment would be either quarterly or every six months, but initially, they had no choice. Sometimes the DAO succeeded in negotiating prices downward but not always. Sometimes Pagonis personally intervened, negotiating directly with property owners or appealing to government officials.[14] Determining what was a just and reasonable value for properties in an inflated market remained a problem. One DAO real estate specialist maintained that the corps got the best price it could in that market and summed up the real estate effort by saying, "I think we got what we were trying to accomplish. We were trying to get our troops out of the sun, out of the sand, and into some air conditioning. . . . I think we've done something that we can be proud of."[15]

The process for handling real estate requirements evolved over time. Initially, in early September, the troop unit identified its requirement, and the requirement went through command channels to the SUPCOM. If the Saudis had no facilities to meet the need, the requirement went to the SUPCOM engineer, and priorities were established. The SUPCOM then directed the DAO to locate and lease the required real estate. SUPCOM priorities changed daily, sometimes hourly.

When the requirements continued to multiply, SUPCOM officials established a board to consolidate the requirements and set priorities. Once the requirement was validated and it was determined that the Saudis could not fill it, the requirement went to the SUPCOM engineers for execution. Terrain managers for all the major commands, the SUPCOM engineers and DAO

Newly constructed shower stalls waiting to be picked up by units.

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real estate specialists met each week to study the list of requirements and establish a priority list. At one point, the list included 80 items. After the board developed a recommended list, it went to Pagonis for approval and became the priority list for the week. The board met again the following week to revalidate the list and to integrate new requirements. Each major subordinate command operating through its terrain manager got a vote on the list.[16]

Initially, the SUPCOM funded the real estate leases, but under the Host Nation Support Agreement negotiated by Ray, the Saudi government agreed to lease facilities for US forces. By 7 November 1990, the last lease requirements had been turned over to the Saudis. At that time, DAO was closing 3.8 leases a day, and 1,200 to 1,500 people were moving into facilities each day. When the Saudis assumed responsibility, this activity came to a complete standstill.

The Saudi government had no experienced real estate specialists. DAO prepared a package with the requirement and the appraisal, and using that package, the Saudis opened negotiations with the property owner. They sometimes attempted to renegotiate for a lower price, without involving the corps specialists in the process. The Saudis required units to revalidate their requirements and evaluate alternative sites before they would fill their requirements. The SUPCOM fell further and further behind in its real estate acquisition timetable, a situation that became more critical as troops from the VII Corps poured into the theater.[17]

In addition to its traditional contract construction, contract services and real estate missions, USACE assumed responsibility for administering a contract between the Administrative Committee for the Gulf Peace Fund and Bechtel International Systems, Inc. The Gulf Peace Fund was established to administer $2 billion of assistance in kind by the government of Japan to support US forces engaged in *Desert Shield*. The money was to be used only for projects outside Saudi Arabia not funded by host nations and for contracts in Saudi Arabia for materials, urgently needed by US forces, that the Saudis could not provide.[18]

Prisoner–of–war camp, March 1991.

On 18 December 1990, CENTCOM directed MEAPO to develop a cost reimbursable contract to be awarded by the Gulf Peace Fund for the performance of engineering and project management services in support of *Desert Shield*. Fund officials signed a short–term contract with Bechtel on 22 January 1991. The format of the contract was based on the American Institute of Architects' standard format for cost reimbursable contracts. Under the contract, CENTCOM provided the requirements. MEAPO assisted in establishing criteria, concept designs, and so forth, that formed the basis of a tasking to the contractor, and it managed the contract and controlled the funding. Bechtel proved to be very responsive, and the arrangement worked well.[19]

While MEAPO–SWA and DAO provided support to *Desert Shield* and *Desert Storm* in theater, other corps districts, divisions and laboratories also made significant contributions. The corps' Wilmington District, for example, responded to a request from the Military Traffic Management Command to clear a shoal area in Cape Fear River in order to facilitate the transport of troops and equipment. The district prepared plans and specifications for dredging at the port of Morehead City, North Carolina. Charleston District, which was responsible for maintaining harbors, expedited a planned contract to improve the Port of Charleston, South Carolina, to meet potential mobilization requirements.[20]

On 10 August 1990, US Forces Command headquarters asked the Department of the Army to task the 535th Engineer Detachment of the Engineering and Housing Support Center (EHSC) to provide prime power teams to support ARCENT. The US Army Prime Power Program, which is managed and executed under the direction of the chief of engineers, maintains an inventory of prime utility power generation, transmission and distribution equipment for support of military contingency plans. The primary mission of a prime power team is to install, operate and maintain a 3–megawatt power plant and up to 3.6–kilowatt amperes of medium voltage distribution equipment. In addition, it provides expertise and technical advice on electrical power systems as required.

Five prime power teams provided support in the theater. . . . [They] conducted over 300 missions, including design, procurement and installation of critical systems to connect electrical converters for eight Patriot air defense batteries . . .[and] provided power for the ARCENT main operations and intelligence center, enemy prisoner–of–war camps, hospitals, clinics, airports, food distribution centers, telecommunications centers and certain Kuwait government buildings.

EHSC activated a 16–man prime power team at Fort Bragg, North Carolina, on 11 August 1990 and a 16–man team at Fort Benning, Georgia, on 28 August. The first 16–man team and three–man company headquarters deployed on 5 September. When they arrived in Saudi Arabia, they were attached to the SUPCOM. The team had no power production equipment with them initially, so they worked on electrical problems such as power surges.[21]

Ultimately, five prime power teams provided support in the theater during *Desert Shield* and *Desert Storm* and later in the reconstruction of Kuwait and Operation *Provide Comfort*. Team 2 deployed on 22 November 1990. Teams 3 and 4, and a company headquarters deployed in March 1991, and the last team deployed on 1 August 1991. By late September 1991, they had conducted over 300 missions, including design, procurement and installation of critical systems to connect electrical converters for eight Patriot

The Waterways Experiment Station in Vicksburg, Mississippi, provided support in the form of dust control, mobility modeling and evaluation, military hydrology and advice on the oil spill cleanup. . . . WES used its Army mobility model to determine the effects of tire pressure and vehicle configuration on desert mobility.

air defense batteries. With their 750–kilowatt generators, they provided power for the ARCENT main operations and intelligence center, enemy prisoner–of–war camps, hospitals, clinics, airports, food distribution centers, telecommunications centers and certain Kuwait government buildings. Team 2 members provided power and electrical support for the cease–fire talks in southern Iraq.[22]

Support from the USACE laboratories was varied and far–reaching. Through the mapping, terrain analysis and imagery intelligence provided by the corps' Engineer Topograhic Laboratories, commanders acquired valuable knowledge of the battlefield. The Waterways Experiment Station (WES) in Vicksburg, Mississippi, provided support in the form of dust control, mobility modeling and evaluation, military hydrology and advice on the oil spill cleanup. In the first months, the Army had problems with wheeled vehicle mobility and with tires—insufficient traction, improper tire pressure and poor tire performance. WES used its Army mobility model to determine the effects of tire pressure and vehicle configuration on desert mobility. It provided guidance on tire inflation pressures and suggested replacement tires for vehicles, which improved overall ground mobility. In November, a WES official traveled to Saudi Arabia as part of a team to analyze tire damage, type, endurance, trafficability, composition, wear and soil interaction on various vehicles. Other officials deployed to provide training and expertise in smoke obscurants to support the Air Force.

WES also provided support in the area of camouflage, concealment and deception (CCD). A WES CCD team assisted the VII Corps, 24th Infantry and 3d Armored divisions and US Central Command Air Force. It helped them procure camouflage materials and trained them in the use of CCD materials. Using a computerized model, WES provided the coalition forces with data to predict water levels, currents and wave conditions in the Persian Gulf. It stepped up its research on dust palliatives in a desert environment and developed a manual for selecting proper materials and methods for dust control.

The corps' Construction Engineering Research Laboratory, Champaign, Illinois, had been developing an integrated Theater Construction Management System. In September 1990, it provided developmental software and a computer hardware platform to two deployed units with encouraging results. The Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire, used its experience from work on the trans–Alaska pipeline to provide information to the Engineer School on crossing the large pipelines that the Iraqis used as obstacles. In addition, the laboratory used its satellite imagery/remote sensing capability to provide information on the location and movement of the massive oil slick in the Persian Gulf.[23]

USACE responded quickly to the contingency in the Middle East and helped fill the void created by the delayed flow of engineer troops. The first USACE personnel to deploy, with their previous experience in theater, provided invaluable support to the CENTCOM commander in receiving and bedding down troops. Over the course of *Desert Shield* and *Desert Storm*, hundreds of civilian volunteers, representing almost every corps district and division, deployed to the theater of operations. Many of these individuals were on site when hostilities began and remained throughout the air war and the ground war. No comprehensive policies or regulations existed governing the deployment and sustainment of Department of Defense civilians in a war zone. Yet, their work was critical. The Army did not have the required real estate expertise among its military personnel. Pagonis noted that the

United States had the lowest medical sick rate of any war in history and attributed that directly to the engineer efforts in building latrines, showers and washstands, and renting facilities. Summarizing the role of DAO personnel, he observed, "... they did exactly what I asked them to do."[24]

Efforts to meet the construction and real estate requirements of US forces, however, would not have been as successful if the troops had not deployed to a part of the world that had an existing supply of contractors, materials and facilities. Without that supply of fuel, equipment and contractors, the engineers' ability to support the troops would have been significantly curtailed. US forces were also fortunate that they did not have to rely solely on time–consuming US funding mechanisms. The Host Nation Support Agreement and the Gulf Peace Fund allowed the USACE staff and others to conduct their real estate and contract construction missions more effectively and more successfully.

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USACE contributions were diverse and significant. Corps personnel worked under difficult conditions to provide for the well–being and safety of thousands of troops. They developed creative solutions to the problems they encountered, whether it be devising new procedures or new designs for projects. After successfully completing its mission during the war, USACE went on to play a key role in the reconstruction of Kuwait. ***MR***

NOTES

Note: Unless otherwise noted, all records cited below are located in the Research Collections of the Office of History, US Army Corps of Engineers, Fort Belvoir, Virginia.

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14. Interview with Adams, 29; interview with Pagonis, 16–17.
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17. Interview with Adams, 48; memorandum, MG William G. Pagonis to BG Robert Frix, chief of staff, CENTCOM, 21 November 1990.
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19. Ibid.; message P 101500Z 91, CDR MEAPO/CESAI–CD to CENTCOM J4/7, Riyadh; interview with Cox, 24 August 1991; briefing slide, "Gulf Peace Fund Contract, GPF—100," nd.
20. Headquarters USACE Emergency Operations Center, Situation Report no. 2, 17 August 1990; Roger Rodriguez, Memorandum for Commander, South Atlantic Division, 15 October 1991; Mickey Fountain, Memorandum for Commander, South Atlantic Division, 16 October 1991.
21. Director EHSC to HQUSACE Emergency Operations Center; "Chronological History," nd., EHSC; HQUSACE Emergency Operations Center, Phone Conversation Record, 6 September 1990; interview with LTC Gilbert Van Sickle, 22d SUPCOM, Dhahran, Saudi Arabia, 26 March 1991, 62–63.
22. "Information Paper," EHSC, 23 September 1991.
23. "US Laboratory Support to Operations *Desert Shield* and *Desert Storm*," (draft) HQUSACE, Directorate of Research and Development," nd, 6–10.
24. Interview with Pagonis, 1 and 16.

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